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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,980	09/26/2003	Byeong Soo Bae	ASIAP119	8857

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EXAMINER

MARKHAM, WESLEY D

ART UNIT	PAPER NUMBER
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1762

DATE MAILED: 07/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/671,980

Applicant(s)

BAE ET AL.

Examiner

Wesley D Markham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

1. Claims 1 – 10 are currently pending in U.S. Application Serial No. 10/671,980, and an Office Action on the merits follows.

Drawings

2. The formal drawings (5 sheets, 9 figures) filed by the applicant on 9/26/2003 are acknowledged.
3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: "4" and "5" in Figure 1. Corrected drawing sheets, or amendment to the specification to add the reference character(s) in the description, are required in reply to the Office Action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office Action. The objection to the drawings will not be held in abeyance.

Specification

4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The following title is suggested: "Method for manufacturing planar optical waveguide having doped inorganic-organic hybrid matrix waveguide layer".
5. The lengthy specification (25 pages, exclusive of the claims) has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.
6. The disclosure is objected to because of the following informalities: The word "perfluoroalkylsilane" on page 23, line 1, of the specification appears to be misspelled "perfluoroaklylsilane". Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 2 – 4 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
9. Regarding **Claim 2** (from which **Claims 3 and 4** depend), the claim requires, in part, that "the hybrid matrix contains silicon and oxygen atoms, with at least a fraction of

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the silicon being directly bonded to substituted or unsubstituted hydrocarbon atoms".

This limitation renders the scope of Claims 2 – 4 indefinite because it is unclear what the applicant means by, "substituted or unsubstituted hydrocarbon atoms".

Specifically, a "hydrocarbon" is not an atom, but a molecule containing only hydrogen and carbon atoms. Additionally, it is unclear how an atom can be either "substituted" or "unsubstituted", as recited in the applicant's claim. After reviewing the specification of the instant application, the examiner notes that there is no discussion or disclosure of what is meant by "substituted or unsubstituted hydrocarbon atoms". For the purposes of examination, the examiner has interpreted the claims to require that at least a fraction of the silicon be directly bonded to substituted or unsubstituted hydrocarbon groups or moieties in the matrix.

10. **Claim 8** requires, in part, that the photochemical monomer be selected from the group consisting of "benzophenone/amines", "thioxane/amines", etc. However, after reviewing the art as a whole, as well as the applicant's specification, the examiner notes that it is unclear what materials / monomers the applicant is attempting to claim by reciting "benzophenone/amines" and "thioxane/amines". Are these materials simply mixtures of (1) benzophenone or thioxane and (2) amines? Are the materials some sort of compound obtained by reacting (1) benzophenone or thioxane and (2) amines? Are the materials a hybrid between (1) benzophenone or thioxane and (2) an amine? Since it is unclear what material / monomer is being claimed, the scope of Claim 8 is unclear, and the claim is indefinite.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

13. Claims 1 – 3 and 5 – 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuramoto et al. (US 2003/0228120 A1) in view of Chandross et al. (USPN 3,809,732).

14. Regarding independent **Claim 1** (from which Claims 2 – 10 depend), Kuramoto et al. teaches a method for manufacturing a planar optical waveguide, the method comprising the steps of forming a lower cladding layer "14" on a substrate "13" (Figures 3 and 4; paragraphs [0031], [0034], and [0140] – [0142]); depositing an optical waveguide layer "15" on the lower cladding layer "14" (Figures 3 and 4;

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paragraphs [0016], [0019] – [0021], [0031], and [0142] – [0143]); patterning the optical waveguide layer “15” to form a core portion “15a” that is thicker than the surrounding material of layer “15” (Figures 3 and 4; paragraphs [0142] – [0143]); and depositing an upper cladding layer “16” on the patterned waveguide (Figure 4; paragraphs [0034] and [0145]); wherein the optical waveguide layer comprises an inorganic-organic hybrid matrix and is polymerized (i.e., “cured”) by thermal heating (paragraphs [0002], [0011], [0019] – [0021], [0031], [0058], and Claim 15). Kuramoto et al. does not explicitly teach that the inorganic-organic hybrid matrix core is uniformly doped with photosensitive photochemical monomers, is selectively exposed to a beam having a predetermined wavelength region, and unexposed monomers are removed. However, the inorganic-organic hybrid matrix waveguide layer of Kuramoto et al. comprises a polymeric component such as polymethylmethacrylate (PMMA) (paragraphs [0019] and [0021]) and is patterned (e.g., via a mold pressing operation) to have thicker waveguiding core portions “15a” surrounded by thinner portions “15” (Figures 3 and 4; paragraphs [0142] – [0143]). Chandross et al. teaches a method of manufacturing an optical waveguide device by using a “photolocking” technique (Col.2, lines 35 – 40). In this technique, a waveguide material based on a polymer such as PMMA (i.e., a polymer as taught by Kuramoto et al. to be a component of the waveguide layer) is uniformly doped with photosensitive photochemical monomers, deposited on a substrate, dried by evaporating the solvent, selectively exposed to a beam having a predetermined wavelength in order to photolock the monomers into the waveguide material layer,

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and heated to remove the unexposed monomers (Figures 1 and 2A – 2D; Col.1, lines 14 – 29, Col.2, lines 30 – 71, and Cols.3 – 6). This “photolocking” process produces a waveguide having a thicker guiding (i.e., core) region surrounded by thinner regions of material (Figure 2D; Col.1, lines 26 – 28, Col.2, lines 42 – 63, and Col.5, lines 41 – 53), which is exactly the goal of the waveguide patterning process of Kuramoto et al. The photolocking process taught by Kuramoto et al. has the following advantages: (1) smooth refractive index and thickness profiles, (2) minimized scattering losses, (3) high spatial resolution, and (4) relative simplicity and economy (Col.2, lines 63 – 71). Therefore, it would have been obvious to one of ordinary skill in the art to form the patterned inorganic-organic hybrid matrix waveguide layer of Kuramoto et al. by photolocking (i.e., uniformly doping the layer with photosensitive photochemical monomers, selectively exposing the layer to a beam having a predetermined wavelength region, and removing unexposed monomers by heating), as taught by Chandross et al., with the reasonable expectation of (1) success, as the waveguide layers of both Kuramoto et al. and Chandross et al. comprise a polymeric material such as PMMA, and (2) obtaining the benefits of using photolocking to form the waveguide layer, such as producing a waveguide layer having thicker core portions surrounded by thinner portions of material, the waveguide having a smooth refractive index and thickness profile, minimal scattering losses, a high spatial resolution, and a relatively simple and economic method of production. Regarding **Claim 2**, the combination of Kuramoto et al. and Chandross et al. also teaches that the hybrid matrix contains silicon and

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oxygen atoms (paragraphs [0019] – [0020] of Kuramoto et al.) but does not explicitly teach that at least a fraction of the silicon is directly bonded to substituted or unsubstituted hydrocarbon groups / moieties. However, the entire inorganic-organic hybrid matrix of Kuramoto et al. is based on polymerizing and bonding (1) organically (e.g., hydrocarbon) modified alkoxides based on metals such as silicon with (2) organic polymers (i.e., materials also based on or comprising hydrocarbon groups) (paragraphs [0019] – [0021]). Therefore, it is the examiner's position that at least a fraction of the silicon atoms (i.e., from the silicon alkoxide) in the hybrid matrix of Kuramoto et al. would have inherently been directly bonded to substituted or unsubstituted hydrocarbon groups / moieties. Regarding **Claim 3**, the combination of Kuramoto et al. and Chandross et al. also teaches that the hybrid matrix comprises an oxide of a metal selected from the elements of groups 3A, 4A, and 3B-5B of the periodic table, and combinations thereof (paragraphs [0019], [0020], and [0058], and Claim 14 of Kuramoto et al.). Regarding **Claims 5 – 7**, the combination of Kuramoto et al. and Chandross et al. also teaches that the photochemical monomers are capable of being dimerized upon radiation, chemically bonding to chains constituting the matrix upon radiation, and/or being polymerized in the matrix upon radiation (Col.3, lines 39 – 55, Col.4, lines 42 – 65 of Chandross et al.). Regarding **Claim 8**, the combination of Kuramoto et al. and Chandross et al. also teaches that the monomers are selected from the group of monomers claimed by the applicant (Col.6, lines 36 – 37, Col.8, lines 52 and 61 of Chandross et al.). Regarding **Claims 9 and 10**, the combination of Kuramoto et al. and Chandross et

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al. teaches that the waveguide is formed by exposure to a beam through a mask covering the waveguide layer (Col.5, lines 28 – 35 of Chandross et al.) or exposure to a laser without a mask (Figure 2C; Col.5, lines 6 – 17, and Col.6, lines 52 – 58 of Chandross et al.).

15. Claims 2 – 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuramoto et al. (US 2003/0228120 A1) in view of Chandross et al. (USPN 3,809,732), in further view of Dawes et al. (USPN 6,144,795).

16. The combination of Kuramoto et al. and Chandross et al. teaches all the limitations of **Claim 4** as set forth above in paragraph 14, except for a method wherein the hybrid matrix comprises fluorine atoms. However, it is clear that the hybrid matrix of Kuramoto et al. is open to including various dopant species (paragraph [0058], for example). Dawes et al. teaches that, in the art of producing an inorganic-organic hybrid optical waveguide device (i.e., with a waveguide material analogous to that of Kuramoto et al.'s), it is desirable to include fluorine atoms in the matrix in order to suppress an undesirable infrared absorption band (Col.1, line 32, Col.5, lines 27 – 28, and Col.8, lines 7 – 16). Therefore, it would have been obvious to one of ordinary skill in the art to include fluorine atoms in the inorganic-organic hybrid matrix material of the combination of Kuramoto et al. and Chandross et al. with the reasonable expectation of successfully and advantageously suppressing an undesirable infrared absorption band in the waveguide material, thereby reducing optical losses in the waveguide.

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17. As an alternative to the reasoning presented above in paragraph 14, the combination of Kuramoto et al. and Chandross et al. teaches all the limitations of **Claims 2 – 4** except for a method wherein the hybrid matrix contains (1) silicon and oxygen atoms, with at least a fraction of the silicon being directly bonded to substituted or unsubstituted hydrocarbon atoms, (2) an oxide of a metal selected from the elements of groups 3A, 4A, and 3B-5B of the periodic table, and combinations thereof, and (3) fluorine atoms. Dawes et al. teaches an inorganic-organic hybrid material used to form the core of a planar optical waveguide, the material comprising (1) silicon and oxygen atoms, with at least a fraction of the silicon being directly bonded to substituted or unsubstituted hydrocarbon atoms, (2) an oxide of a metal selected from the elements of groups 3A, 4A, and 3B-5B of the periodic table, and combinations thereof, and (3) fluorine atoms (Abstract, Col.1, lines 17 – 41, Col.2, lines 40 – 67, Col.4, lines 40 – 67, Cols. 5 – 6, Col.7, lines 52 – 67, Col.8, lines 1 – 16, and Col.10, lines 51 – 57). This hybrid material taught by Dawes et al. has the following advantages: (1) low cost, (2) low absorbance, (3) can have a range of indices of refraction, (4) rapid deposition, and (5) unique visco-elastic properties that enable the material to avoid stress build-up during polymerization / curing (Col.2, lines 29 – 33, Col.11, lines 38 – 43). Therefore, it would have been obvious to one of ordinary skill in the art to utilize the inorganic-organic hybrid material of Dawes et al. as the waveguide material in the process of the combination of Kuramoto et al. and Chandross et al. with the reasonable expectation of successfully and advantageously utilizing a material for the

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waveguide core that is low cost, has low absorbance, can be rapidly deposited, and has unique visco-elastic properties that enable the material to avoid stress build-up during polymerization and curing.

18. Claims 1 – 3 and 5 – 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chandross et al. (USPN 3,809,732) in view of Zha (US 2003/0195321 A1).

19. Regarding independent **Claim 1** (from which Claims 2 – 10 depend), Chandross et al. teaches a method of manufacturing a planar optical waveguide, the method comprising the steps of depositing an optical waveguide layer “21” or “22” on a substrate “24”, and patterning the optical waveguide layer by using a photolocking technique, wherein the optical waveguide layer comprises an organic (i.e., polymeric) matrix uniformly doped with photosensitive photochemical monomers, is selectively exposed to a beam having a predetermined wavelength region, unexposed monomers are removed, and the patterned layer is cured by thermal heating (Figures 1 and 2A – 2D; Col.1, lines 14 – 29, Col.2, lines 30 – 71, and Cols.3 – 6). Chandross et al. does not explicitly teach that (1) a lower cladding layer is deposited on the substrate below the optical waveguide layer, and an upper cladding layer is deposited on the patterned waveguide layer, and (2) the matrix is an inorganic-organic hybrid matrix. Zha teaches that, in the art of manufacturing planar optical waveguides (paragraph [0043]), a waveguide is typically and preferably produced by forming a lower cladding layer on a substrate, a core layer on the lower cladding layer, and an upper cladding layer on the core layer, wherein the cladding

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layers have a lower refractive index than the core layer and the same refractive index as each other in order to insure that the guided optical mode is symmetric (paragraph [0072]). Therefore, it would have been obvious to one of ordinary skill in the art to deposit a lower cladding layer on the substrate below the optical waveguide layer and an upper cladding layer on the patterned waveguide layer in the process of Chandross et al. (i.e., to sandwich the core layer between two cladding layers), as taught by Zha, with the reasonable expectation of successfully and advantageously producing a waveguide that has a guided mode desired by the purveyor in the art. Additionally, by sandwiching the core layer of Chandross et al. between two cladding layers, as is typically done in the art of planar optical waveguides (see Zha), one of ordinary skill in the art would have reasonably expected to reduce optical losses in the waveguide of Chandross et al. (i.e., because the lower refractive index cladding layers would serve to contain the light within the core of the waveguide and prevent the light from escaping from the core). Further and importantly, Zha teaches that hybrid inorganic-organic materials are excellent candidates for optical waveguide materials because the hybrid materials share many of the benefits of polymers (e.g., rapid material deposition, low processing temperature, etc.) while the silicate (i.e., inorganic) backbone increases the hardness and dilutes the hydrocarbon content, thereby reducing optical absorption (paragraph [0002]). In other words, Zha teaches that hybrid inorganic-organic materials combine the advantages of purely organic materials with the advantages of purely inorganic materials. Therefore, it would have been obvious to

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one of ordinary skill in the art to utilize a hybrid inorganic-organic material, such as the material taught by Zha, as the matrix material in the process of Chandross et al. with the reasonable expectation of successfully producing a waveguide by photolocking (as desired by Chandross et al.), the waveguide core being made of a material (i.e., a hybrid inorganic-organic material) that combines the advantages of an inorganic material (i.e., hardness, low optical loss) with the advantages of an organic / polymeric material (i.e., rapid material deposition, low processing temperature), thereby being superior to the solely polymeric waveguide material taught by Chandross et al. Regarding **Claim 2**, the combination of Chandross et al. and Zha also teaches that the hybrid matrix contains silicon and oxygen atoms (paragraphs [0019] – [0021], [0050], and [0055] of Zha) but does not explicitly teach that at least a fraction of the silicon is directly bonded to substituted or unsubstituted hydrocarbon groups / moieties. However, the entire inorganic-organic hybrid matrix of Zha is based on polymerizing / bonding organically (e.g., hydrocarbon) modified alkoxides based on metals such as silicon, the silicon alkoxides having at least one M-C bond (i.e., Si-alkyl group bond) (paragraphs [0015] – [0020]). Therefore, it is the examiner's position that at least a fraction of the silicon atoms (i.e., from the silicon alkoxide) in the hybrid matrix of Zha et al. would have inherently been directly bonded to substituted or unsubstituted hydrocarbon groups / moieties such as alkyl groups. Regarding **Claim 3**, the combination of Chandross et al. and Zha also teaches that the hybrid matrix comprises an oxide of a metal selected from the elements of groups 3A, 4A, and 3B-5B of the periodic table, and combinations

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thereof (paragraphs [0021] and [0077] of Zha). Regarding **Claims 5 – 7**, the combination of Chandross et al. and Zha also teaches that the photochemical monomers are capable of being dimerized upon radiation, chemically bonding to chains constituting the matrix upon radiation, and/or being polymerized in the matrix upon radiation (Col.3, lines 39 – 55, Col.4, lines 42 – 65 of Chandross et al.).

Regarding **Claim 8**, the combination of Chandross et al. and Zha also teaches that the monomers are selected from the group of monomers claimed by the applicant (Col.6, lines 36 – 37, Col.8, lines 52 and 61 of Chandross et al.). Regarding **Claims 9 and 10**, the combination of Chandross et al. and Zha teaches that the waveguide is formed by exposure to a beam through a mask covering the waveguide layer (Col.5, lines 28 – 35 of Chandross et al.) or exposure to a laser without a mask (Figure 2C; Col.5, lines 6 – 17, and Col.6, lines 52 – 58 of Chandross et al.).

20. Claims 2 – 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chandross et al. (USPN 3,809,732) in view of Zha (US 2003/0195321 A1), in further view of Dawes et al. (USPN 6,144,795).

21. The combination of Chandross et al. and Zha teaches all the limitations of **Claim 4** as set forth above in paragraph 19, except for a method wherein the hybrid matrix comprises fluorine atoms. However, it is clear that the hybrid matrix of Zha is open to including various dopant species (paragraph [0077], for example). Dawes et al. teaches that, in the art of producing an inorganic-organic hybrid optical waveguide device (i.e., with a waveguide material analogous to that of Zha's), it is desirable to

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include fluorine atoms in the matrix in order to suppress an undesirable infrared absorption band (Col.1, line 32, Col.5, lines 27 – 28, and Col.8, lines 7 – 16).

Therefore, it would have been obvious to one of ordinary skill in the art to include fluorine atoms in the inorganic-organic hybrid matrix material of the combination of Chandross et al. and Zha with the reasonable expectation of successfully and advantageously suppressing an undesirable infrared absorption band in the waveguide material, thereby reducing optical losses in the waveguide.

22. As an alternative to the reasoning presented above in paragraph 19, the combination of Chandross et al. and Zha teaches all the limitations of **Claims 2 – 4** except for a method wherein the hybrid matrix contains (1) silicon and oxygen atoms, with at least a fraction of the silicon being directly bonded to substituted or unsubstituted hydrocarbon atoms, (2) an oxide of a metal selected from the elements of groups 3A, 4A, and 3B-5B of the periodic table, and combinations thereof, and (3) fluorine atoms. Dawes et al. teaches an inorganic-organic hybrid material used to form the core of a planar optical waveguide, the material comprising (1) silicon and oxygen atoms, with at least a fraction of the silicon being directly bonded to substituted or unsubstituted hydrocarbon atoms, (2) an oxide of a metal selected from the elements of groups 3A, 4A, and 3B-5B of the periodic table, and combinations thereof, and (3) fluorine atoms (Abstract, Col.1, lines 17 – 41, Col.2, lines 40 – 67, Col.4, lines 40 – 67, Cols. 5 – 6, Col.7, lines 52 – 67, Col.8, lines 1 – 16, and Col.10, lines 51 – 57). This hybrid material taught by Dawes et al. has the following advantages: (1) low cost, (2) low absorbance, (3) can have a range of

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indices of refraction, (4) rapid deposition, and (5) unique visco-elastic properties that enable the material to avoid stress build-up during polymerization / curing (Col.2, lines 29 – 33, Col.11, lines 38 – 43). Therefore, it would have been obvious to one of ordinary skill in the art to utilize the inorganic-organic hybrid material of Dawes et al. as the waveguide material in the process of the combination of Chandross et al. and Zha with the reasonable expectation of successfully and advantageously utilizing a material for the waveguide core that is low cost, has low absorbance, can be rapidly deposited, and has unique visco-elastic properties that enable the material to avoid stress build-up during polymerization and curing.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Chandross et al.(2) (USPN 3,953,620) teaches producing an optical waveguide by photolocking a polynuclear aromatic thiol monomer into a polymeric material. Rantala (US 2004/0008960 A1) is cited to show that organic-inorganic hybrid waveguide materials are superior to either purely organic (i.e., polymeric) or inorganic materials in the art of optical waveguides. Fardad et al. (US 2004/0033309 A1) teaches a fluorinated, metal oxide-containing, organic-inorganic hybrid material used in optical waveguide structures.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is (571)

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272-1422. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



WDM

Wesley D Markham
Examiner
Art Unit 1762



SHRIVE P. BECK
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700